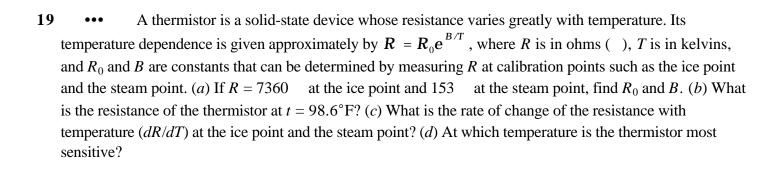
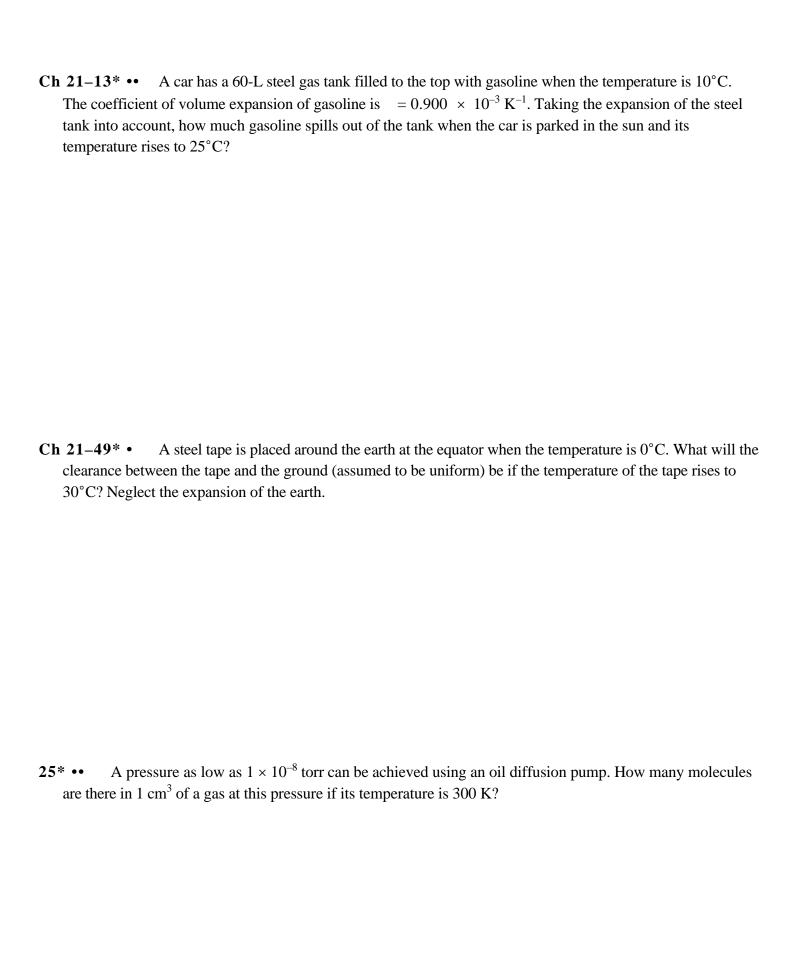
• The length of the column of mercury in a thermometer is 4.0 cm when the thermometer is immersed in ice water and 24.0 cm when the thermometer is immersed in boiling water. (a) What should the length be at room temperature, 22.0°C? (b) If the mercury column is 25.4 cm long when the thermometer is immersed in a chemical solution, what is the temperature of the solution?

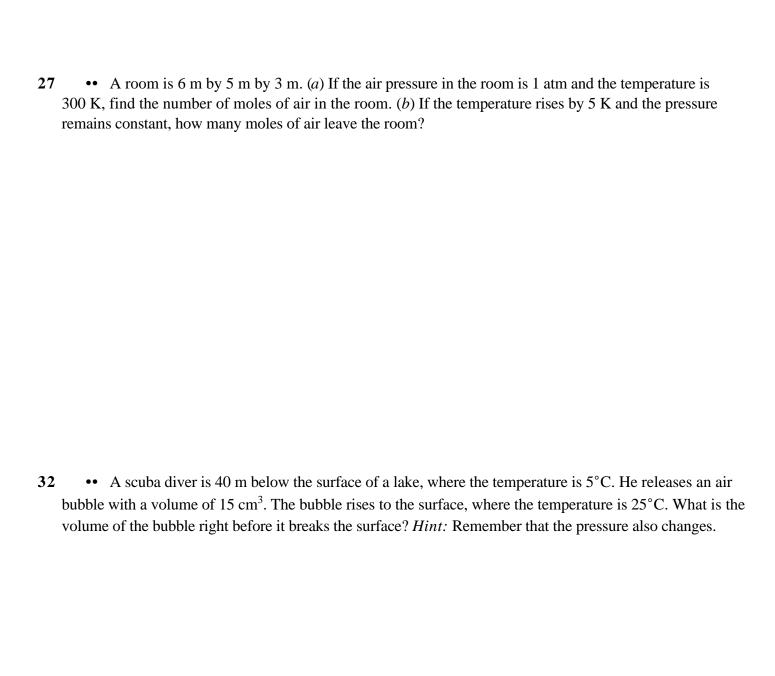
• The pressure of a constant-volume gas thermometer is 0.400 atm at the ice point and 0.546 atm at the steam point. (a) When the pressure is 0.100 atm, what is the temperature? (b) What is the pressure at 444.6°C, the boiling point of sulfur?

13* • A constant-volume gas thermometer reads 50 torr at the triple point of water. (*a*) What will the pressure be when the thermometer measures a temperature of 300 K? (*b*) What ideal-gas temperature corresponds to a pressure of 678 torr?

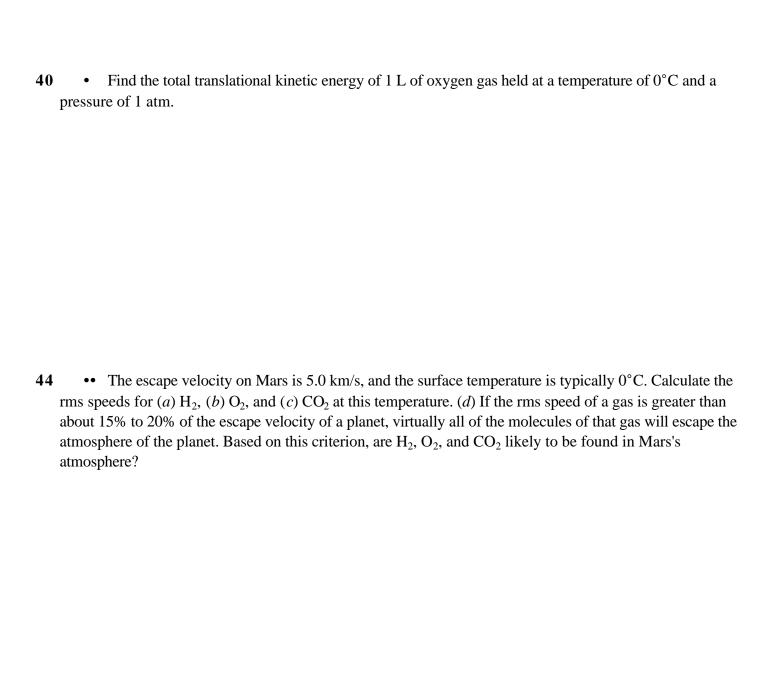


Ch 21–4 • A bridge 100 m long is built of steel. If it is built as a single, continuous structure, how much will its length change from the coldest winter days (–30°C) to the hottest summer days (40°C)?





- 33* ••• A helium balloon is used to lift a load of 110 N. The weight of the balloon's skin is 50 N, and the volume of the balloon when fully inflated is 32 m³. The temperature of the air is 0°C and the atmospheric pressure is 1 atm. The balloon is inflated with sufficient helium gas so that the net force on the balloon and its load is 30 N, directed upward. Neglect changes of temperature with altitude and neglect the mass of the air displaced by the load and the balloon's skin in calculating the buoyant force.
 - (a) How many moles of helium gas are contained in the balloon?
 - (b) At what altitude will the balloon be fully inflated?
 - (c) Does the balloon ever reach the altitude at which it is fully inflated?
 - (d) If the answer to (c) is affirmative, what is the maximum altitude attained by the balloon?



48 •• The class in Room 101 prepares their traditional greeting for a substitute teacher. Ten toy cars are wound up and released as the teacher arrives. The cars have the following speeds.

Speed, m/s 2 5 6 8 Number of cars 3 3 3 1

Calculate (a) the average speed, and (b) the rms speed of the cars.

50 •• Since f(v) dv gives the fraction of molecules that have speeds in the range dv, the integral of f(v) dv over all the possible ranges of speeds must equal 1. Given the integral

$$v^2 e^{-av^2} dv = \frac{\sqrt{a^{-3/2}}}{4} a^{-3/2}$$

show that f(v) dv where f(v) is given by $f(v) = \frac{4}{\sqrt{}} \frac{m}{2kT} v^2 e^{-mv^2/(2kT)}$ (Equation 18–37).